STAT [redacted]

QUOTATION

June 29, 1966

OUR QUOTE NO. 1501

STAT [redacted]
Washington, D. C.

IN REPLY TO YOUR INQUIRY Verbal

WE ARE PLEASED TO QUOTE AS FOLLOWS:

Item	Qty	Description	Unit Price
1	270	Sleeves (Multiple Thread 24 pitch 6 lead)	STAT [redacted]
2	10-20	Carrying Cases - 9 parts per case. Wood construction with Vinyl covering. Foam material inside box to contain openings for 9 lenses.	

DELIVERY: Item 1: 8 Wks ARO
Item 2: 6 Wks ARO

TERMS: Net 30 Days
F.O.B.: Washington, D. C

WE APPRECIATE THIS OPPORTUNITY OF QUOTING AND HOPE TO BE FAVORED WITH YOUR ORDER.

SINCERELY,

STAT [redacted]

NGA Review Complete

GSW/d

TERMS OF QUOTATION

1. We guarantee that all items manufactured by us shall be correct and in accordance with any drawing, sketches, plans or designs whether submitted by the purchaser or by us, or developed by joint efforts; HOWEVER, we do not guarantee the workability or practicability of the said terms, or that they will meet the requirements or produce any result desired by the purchaser.

2. Any changes in specifications or plans on all orders shall be subject to a re-adjustment in cost. In the event that such changes increase the costs of the work, the amount shall be added to the original contract price. Customers shall receive credit for any services occasioned by changes in specifications of the work ordered.

3. All orders are subject to increase in costs of material and labor occurring during the progress and completion of the work. Such increased costs shall be considered as part of the original contract.

4. Prices do not include boxing or crating unless expressly stated on quotation or contract.

Approved For Release 2005/02/17 : CIA-RDP78B04770A001200030009-8

Microscopic Measuring Methods

1. General remarks

More and more the microscope proves to be indispensable in technical research, all the more so, since this instrument permits of carrying out various measurements on small objects (textile fibres, crystals, powders, etc.).

In general, horizontal distances are being measured with a micrometer eyepiece, which has previously been calibrated with an object micrometer. In [redacted] microscopes, vertical distances can be measured to within 1 μ on the fine adjustment drum (1 scale interval = 2 μ; error tolerance due to mechanical causes less than 0.5 μ), or, if greater accuracy is needed, by means of a feeler dial, mounted on an M 10 spec. model.

a. The Object Micrometer

The object micrometer is a small glass plate which has the size of an object carrier and into which lines have been engraved at certain intervals. In the following we shall make use of the term 1 μ (= 1 micron = $^1/_{1000}$th millimeter). The new [redacted] object micrometers carry the following divisions:

5 mm divided into 10 parts of 0.5 mm or 500 μ
2 mm divided into 20 parts of 0.1 mm or 100 μ
0.2 mm divided into 20 parts of 0.01 mm or 10 μ

For low magnifications the 500 μ intervals, for medium magnifications the 100 μ intervals and for high magnifications the 10 μ intervals will be used.

Fig. 1. Scale of the object micrometer

b. The Micrometric Eyepieces

[redacted] micrometric eyepieces are Huygens type eyepieces with magnification factors of 6 ×, 7 × and 10 ×. Behind the collector lens a glass plate with engraved scale has been applied. Together with the object, this scale is clearly visible because it lies in the plane of the real intermediate image. A highly accurate screw micrometer [redacted]

in this eyepiece is not read off the actual scale but on a measuring drum (see page 4).

The collector lens of a standard micrometric eyepiece together with its mounting can be screwed off, whereupon the little metal hood can be withdrawn. In this way the micrometer scale plate may be replaced by another one carrying e.g. grid division or cross hairs.

STAT [redacted] eyepiece micrometers carry the following divisions:

10 mm divided into 100 parts for 6 × measuring eyepiece
(10 mm divided into 100 parts for 7 × measuring eyepiece)
5 mm divided into 100 parts for 10 × measuring eyepiece

The various micrometers as well as the cross hairs can be supplied separately (see «accessories for microscopic measurements» Mi 523e).

2. Calibrating the micrometric eyepieces

Before carrying out any measurements it is necessary for us to know which distance in the object corresponds to one interval in the eyepiece micrometer. This distance is called micrometer value.

In order to determine this value, the following steps will be necessary:

a. Replace the standard eyepiece by the micrometric eyepiece to be used. Focus on the scale by adjusting the eyelens.

b. Fasten the object micrometer to the stage, then focus on its scale.

c. The eyepiece micrometer and the image of the object micrometer must now lie in the same plane, which means that they are free from parallax. Check this by slightly moving the head. The two scales must not move one with respect to the other. If they do, the microscope fine adjustment is to be used until any parallax has been eliminated.

d. Read the number b of scale intervals on the object micrometer which correspond to a number a of intervals in the eyepiece micrometer.

One interval of the eyepiece micrometer then corresponds to $\frac{b}{a}$ intervals of the object micrometer, one interval of which should be $E\,\mu$ (the possible values for E have been given above). There results a micrometer value of

$$M = \frac{b \cdot E}{a}$$

This calibration is to be carried out for each optical system. It is recommended to compile a table, in order to get rid of this step once and for all. If a draw tube is being used it must be forgotten that each change of length influences on the picture scale and that therefore another micrometer value is to be used.

The following table gives the mean micrometer values for various combinations of optical systems (standard tube length 160 mm):

Objectives (former types in parenthesis)			10 ×	(7 ×)	6 ×
Achromat	3 ×		22.73 μ	52.00 μ	52.00 μ
Achromat	4 ×		17.10 μ	39.52 μ	39.52 μ
(Achromat	7 ×)		9.78 μ	22.22 μ	22.20 μ
Achromat	10 ×		6.89 μ	15.78 μ	15.38 μ
Achromat	20 ×		3.40 μ	7.78 μ	7.50 μ
Achromat	40 ×		1.71 μ	3.91 μ	3.91 μ
Achromat	60 ×		1.15 μ	2.64 μ	2.55 μ
(Achromat	85 ×)	(oil immersion)	0.84 μ	1.92 μ	1.85 μ
Achromat	100 ×	(oil immersion)	0.66 μ	1.56 μ	1.51 μ
[redacted] Plane-Fluotar	3 ×		22.70 μ	51.70 μ	51.70 μ
[redacted] Fluotar	10 ×		6.85 μ	15.73 μ	15.83 μ
[redacted] Fluotar	20 ×		3.40 μ	7.80 μ	7.52 μ
[redacted] Fluotar	40 ×		1.71 μ	3.95 μ	3.95 μ
[redacted] Fluotar	50 ×	(oil immersion)	1.35 μ	3.10 μ	3.10 μ
[redacted] Fluotar	100 ×	(oil immersion)	0.66 μ	1.56 μ	1.51 μ

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If a binocular inclined tube of 1.5 magnifying factor is being used, the above mean values must be multiplied by $^2/_3$rd.

Example of a length measurement
(Diameter of a textile fibre)

Optical system:

achromatic objective ..... 40 ×
micrometric eyepiece ..... 10 ×
tube length ..... 160 mm

Calibration:

Length of 1 interval in the object micrometer E = 10 μ. The 19th and 78th division lines of the eyepiece micrometer correspond to the 4th resp. 14th line of the object micrometer. This means that a = 59 intervals in the eyepiece correspond to b = 10 intervals in the object, 1 interval of the eyepiece micrometer thus being $\frac{b}{a} = \frac{10}{59}$ intervals of the object micrometer or $\frac{b \cdot E}{a} = \frac{10}{59} \cdot 10\ \mu = 1.70\ \mu$.

For length measurements it is often convenient, at least for the currently used objectives [redacted] Fluotar 50 × and [redacted] Fluotar 40 ×, to avoid fractions of micrometer values. However the magnifying power of objectives is subject to certain vaccillations, due to technical reasons, which can be eliminated only by means of a variable tube length. Upon special request micrometer plates for the 10 × measuring eyepiece can be supplied, which, if used with either the [redacted] Fluotar 50 × or Achromat 40 × and drawtube, will give micrometer values of 1 resp. 2 μ.

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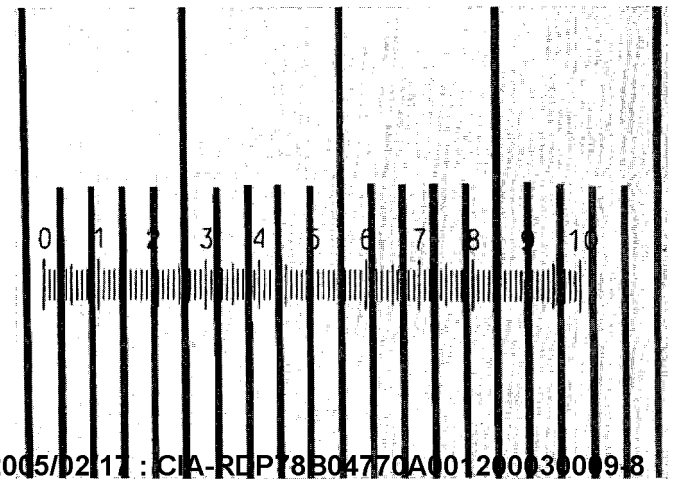
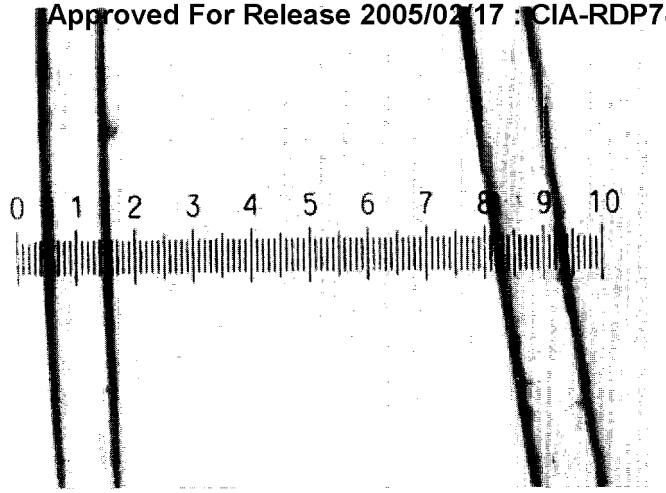


Fig. 2. Scale of the object micrometer in the field of view of the measuring eyepiece for calibration.



The object micrometer is replaced by the preparation. Observation shows that the fibre measures 12 scale divisions in the eyepiece micrometer = 12 · 1.70 μ = 20.40 μ.

The figures 2 and 3 show the technique of calibrating and measuring.

Fig. 3. Measuring the diameter of a textile fibre.

3. The Screw Micrometer Eyepiece

This eyepiece micrometer combines higher accuracy with easier measurings. To this end, a 15 × compensating eyepiece (to be matched with [redacted] Fluotar objectives) is used. In the field of view, a fixed scale is visible, whereas a vertical reference line moves with respect to the scale. One full turn of the drum causes this line to move by one interval. On its circumference this drum carries a scale of 100 intervals. With the 40 × [redacted] Fluotar objective and 160 mm tube length (monocular straight or inclined tube) such an interval corresponds to 0.12 μ in the object.

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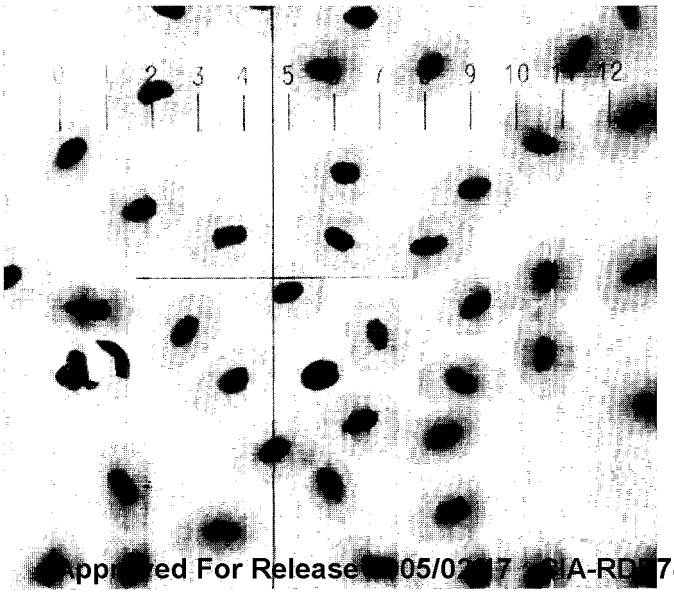


Fig. 4. Field of view of the screw micrometer eyepiece.

Calibrating is done [illegible] piece. However, in order to make full use of this eyepiece's performance, several calibrations as well as length measurements on the object to be measured are to be made then, taking the mean of these values.

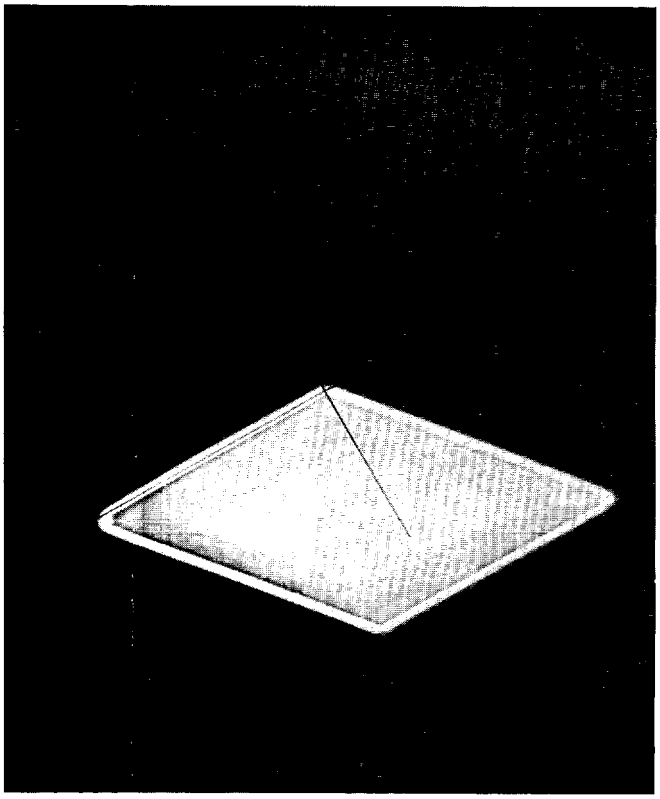


Fig. 5. Angle measurements on crystals with the goniometer eyepiece.

4. Measuring Lengths and Surfaces by means of Projection

If no high degree of accuracy is required, the micrometric eyepiece can be dispensed with. By means of the projection mirror the scale of the object micrometer is projected onto the table and drawn on white paper. The image scale is thus easily determined, since the distance of the division lines in the object is known.

In order to get good results, a plane projection mirror must be used, the face of which is to be true to the bisectrice of the angle formed by the tube axis and the vertical onto the plane of projection (projection drawing mirror, Ref. Number 5620).

In case [illegible] first projected onto the drawing plane. The distance lines are now drawn on paper, whereupon a square is designed, the sides of which are divided into a convenient number of intervals.

If the object to be measured is now projected onto the drawing plane and adjacent to the above square, both figures can be cut out of the paper and compared as to their respective weights. The two surfaces can also be compared by means of a planimeter. The object's true surface can easily be calculated, since the superficies of the surface in the plane of the object, corresponding to the drawn square is known.

We procure appropriate planimeters if they should not be available elsewhere.

5. Angle Measurements

For angle measurements the goniometer eyepiece is used, this latter being a 15 × compensating eyepiece, carrying a glass plate with 360° division instead of a micrometer (see fig. 5).

On turning the eyelens, cross-wires can be seen rotating in this scale. This simple arrangement allows for angle measurements to within 1° and, for skilled observers, estimation of ½rd of a degree (20').

6. Measuring Vertical Distance

With the fine adjustment it is possible to focus in turn on two different planes of the preparation. Provided that a homogeneous oil immersion be used and that the refraction index of the cover glass be the same as that of the preparation, the difference between the two drum readings (1 interval = 2 μ) gives directly the vertical distance of the two planes. The measuring accuracy will then be limited only by the objective's depth of focus and the slight inaccuracy of the fine adjustment, which is due to the mechanical transmission (approx. 0.5 μ for M 11, for the M 20 practically o in any measurement). Small depth of focus (high apertures) will of course increase the measuring accuracy.

Provided that the embedding medium for the preparation has the same refraction index as the cover glass, only the refraction of the light rays at the transition from the air into the cover glass plays any role as to the performance of a dry system (see fig. 6).

A change of level CD of the front lens or of the stage (which comes to the same) corresponds to the distance $A'B'$, whereas we should know distance AB. There results

$$AB = n \cdot CD$$

n = the refraction index of the cover glass being $\simeq 1.5$.

If a dry system is used, the difference of the drum readings are thus to be multiplied by 1.5 in order to compute the vertical distance between the two planes of focusing. Furthermore it must be taken into consideration that the above formula tallies only if the embedding medium's refraction index is approximately the same as that of the cover glass.

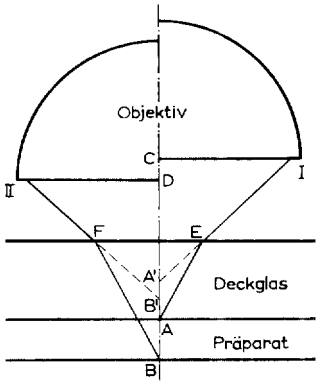
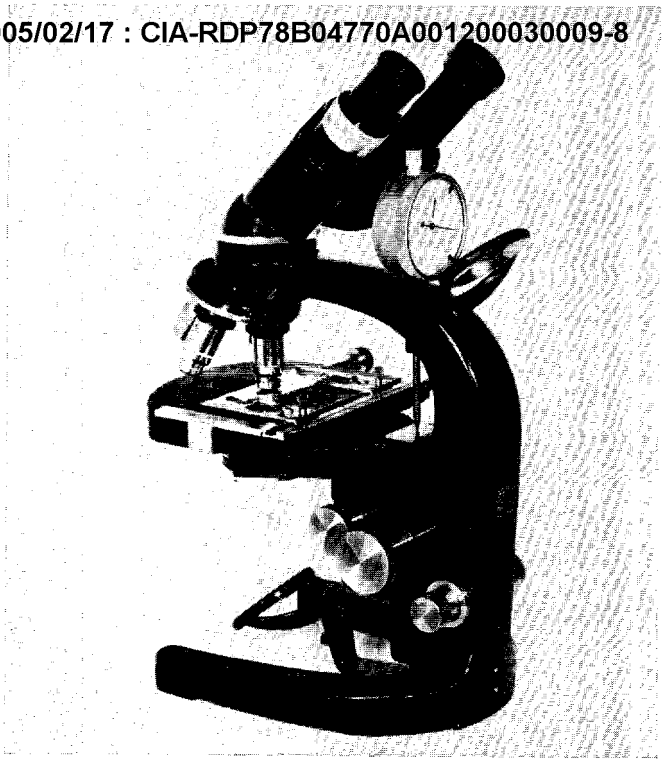


Fig. 6. Measuring of vertical distances with a dry system.



STAT [ ] M 10 spec. Microscope with feeler dial.

7. Microscope M 10 spec. with feeler dial

In order to facilitate depth measurements and to ensure higher accuracy, a microscope with feeler dial according to fig. 7 is used to advantage.

Thanks to their design, [ ] microscopes are especially suitable for the adaptation of such feeler dials. One interval of such a dial corresponds to a stage displacement of 1 μ, and half a micron can still easily be read off. The full revolutions (= 200 μ) are registered on a special scale and must thus not be counted. A mirror (of the same type as used for the illumination) can be slipped into a recess of the stand, which permits of reading the feeler dial without moving one's head.

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The M 10 spec. microscope, equipped with measuring and goniometer eyepieces and the outstanding [ ] Fluotar oil-immersions lends itself especially well to measuring photographic plates of nuclear reactions.

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8. Extent of delivery

As to the extent of delivery, see folder Mi 523e «Accessories for [illegible]»

Our manufacturing program: Microscopy

WILD M 11 Stand: Binocular or monocular microscope for laboratories, schools and travels with practical novel-type packing.

WILD M 20 Stand: Binocular or monocular general purpose and research microscope for highest requirements.

Numerous accessories: Modern illumination equipments, highly efficient, spring mounted [redacted]-Fluotar objectives; various equipments for phase contrast, special phase condensor with long working distance; dark field immersion condensor; photomicrographic camera; electromagnetic fine adjustment; drawing and projection mirror; polarization and blue light fluorescence equipments, etc.
Ask for detailed offers and literature.

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Illustrations and descriptions contained herein are not binding for sales contracts –

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Accessories for microscopic measurements

Since the use of microscopy for technical purposes is becoming more and more frequent, precise microscopic measuring devices prove to be of ever increasing importance in almost any field of industrial enterprise. In the field of microscopic research also, precise measurements are often needed.

Our manufacturing program comprises the following special objectives, micrometer plates and object micrometers for measurements of lengths, angles and surfaces:

Object micrometer — Key number

Scale of 5 mm divided into ½ mm, 2 mm divided into $^1/_{10}$ mm, 0,2 mm divided into $^1/_{100}$ mm, in case (fig. 1) 8410

This object micrometer serves for calibrating purposes, c. g. for the determination of the length to which corresponds one part of the division of the micrometer plate in the object (as to the micrometer value, see instructions "technique of microscopic measurements").

Fig. 1 object micrometer

Huygens type measuring eyepieces without micrometer

6× measuring eyepiece (field number 18) 5652

7× measuring eyepiece (field number 17.5) 272

10× measuring eyepiece (field number 14) 5655

Huygens type measuring eyepieces with micrometer plate

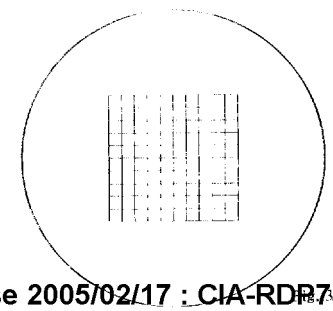
6× measuring eyepiece with 10:100 plate (10 mm divided into 100 parts, fig. 2) 5653

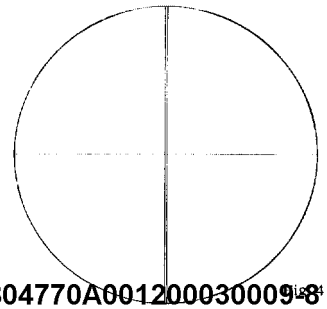
7× measuring eyepiece with 10:100 plate (10 mm divided into 100 parts, fig. 2) 268

10× measuring eyepiece with 5:100 plate (5 mm divided into 100 parts, analogous to fig. 2) 5656

Fig. 2 Field of view of the single eyepiece micrometer division 5:100

Single eyepiece micrometers (∅ 16 mm)	Key number
Scale 10 mm divided into 100 parts (fig. 2)	5680
Scale 5 mm divided into 100 parts (analogous to fig. 2)	5681
Rectangular division (5 mm)² divided into squares of 1 mm side length (fig. 3)	5682
Rectangular division (10 mm)² divided into squares of 1 mm side length (analogous to fig. 3)	5683
Cross hairs (fig. 4)	5684





Field of view of the single eyepiece micrometer
Fig. 3 rectangular division, 5 mm²
Fig. 4 [illegible]

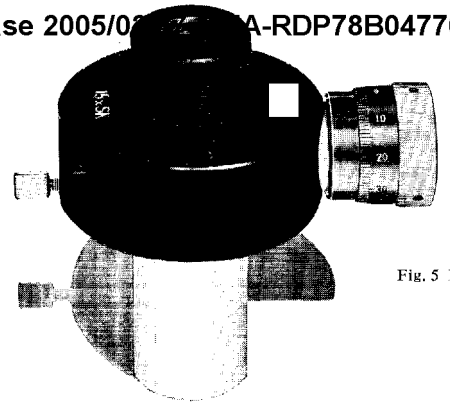


Fig. 5 Eyepiece with micrometer screw

Eyepiece with micrometer screw Key number

For length measurements of highest accuracy the 15× eyepiece with micrometer screw is used (compensated eyepiece, 6 mm divided into 12 parts) 5675

The approximate micrometer values of the measuring plates as listed above, resulting with various objectives, are given in the instruction booklet "microscopic measuring methods".

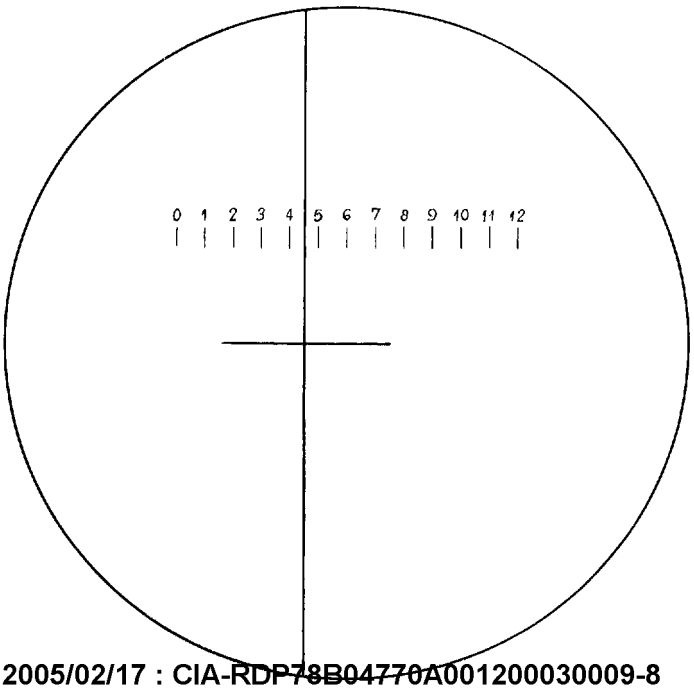


Fig. 6 Field of view of the eyepiece with micrometer screw. The cross hairs can be moved with respect to the field of view by actuating the measuring screw

The goniometer eyepiece (10× examination eyepiece) is used for angular measurements. Instead of a micrometer, the glass plate behind the collector lens carries a circle, divided into 360°. The eyelens mount can be turned, whereas the one of the collector lens can be fixed at given rotation angles by means of a clamping screw on the tube. When turning the eyelens, a reticle cross in the field of view rotates over the fixed scale of angles. Reading is to one half of a degree, while fifths can still be estimated.

Key number

15 goniometer eyepiece (fig. 7) 5670

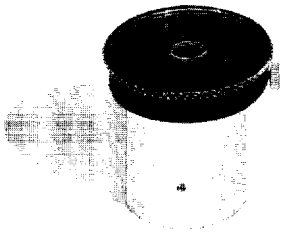


Fig. 7 Goniometer eyepiece

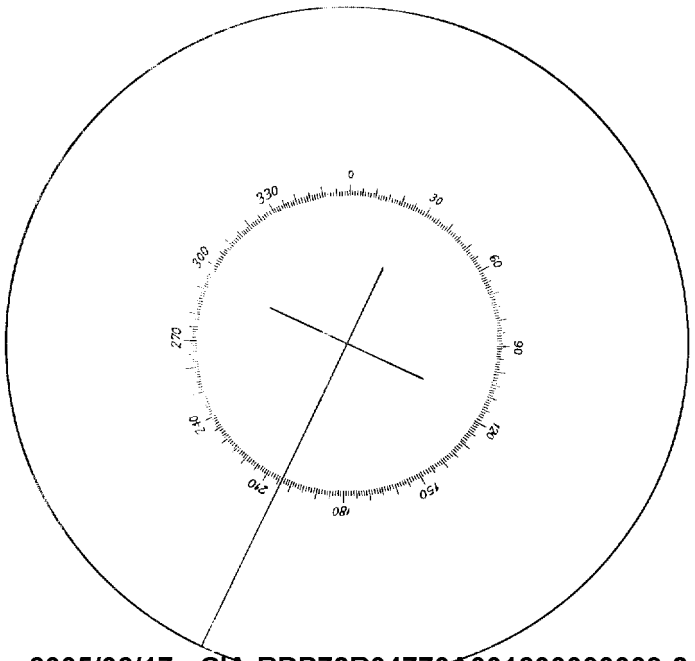


Fig. 8 Field of view of the 10× goniometer eyepiece

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